

Hot-Electron Nanobolometers Based on Disordered GaN Heterostructures, Phase I

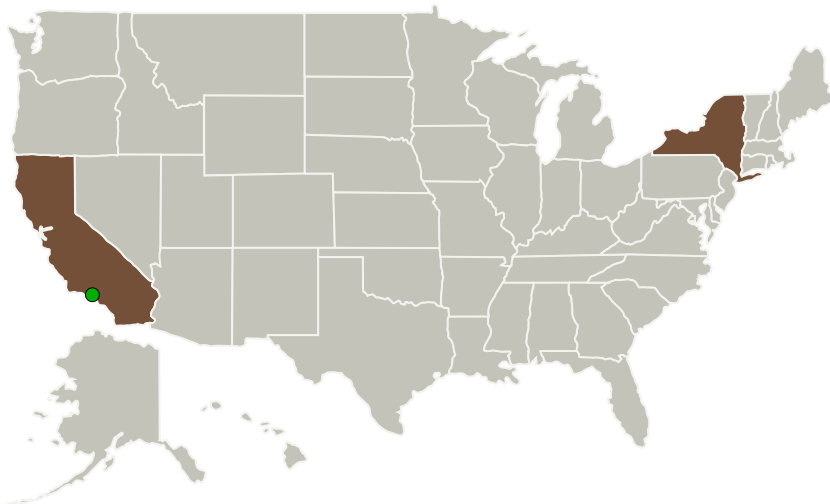
Completed Technology Project (2012 - 2012)



Project Introduction

The proposed research is to develop hot electron THz nanobolometers (nanoHEB) with unprecedented low electron heat capacity (~ 10 - 19 J/K) for use in advanced heterodyne receivers, operating from liquid nitrogen to room temperatures. The sensor is based on the effect of electron heating in highly disordered two-dimensional electron gas (2DEG) in GaN heterostructures. Several methods for 2DEG nanoscale patterning, including the split-gate design, are proposed to fabricate the antenna coupled nanodevices. Because of the small electron heat capacity of the sensor, the proposed mixer requires the power of local oscillator (LO) at the level of 1 - 10 μ W. With these sensors a single chain of THz multipliers may be used to provide LOs to entire array of sensors in imaging applications of heterodyne detectors. The picosecond hot electron cooling allows wide bandwidth (to 30 MHz). The project goals are to develop a technological route for fabrication of 2DEG AlInN/GaN microdevices, demonstrate effects of electron heating by 2 - 4 THz radiation in AlInN/GaN nanodevices, determine basic transport and kinetic parameters, and develop a preliminary prototype nanobolometer for 2 - 4 THz range.

Primary U.S. Work Locations and Key Partners



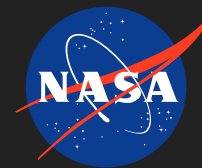
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Organizations Performing Work	Role	Type	Location
Esensors Inc.	Lead Organization	Industry	Amherst, New York
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	New York

Project Transitions

▶ **February 2012:** Project Start

✓ **August 2012:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138597>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Esensors Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

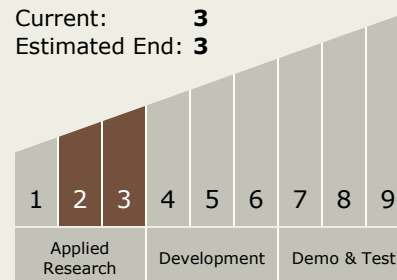
Carlos Torrez

Principal Investigator:

Darold Wobschall

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System